

## PATENT ABSTRACTS OF JAPAN

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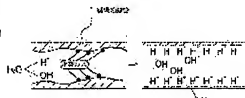
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(54) ADDITIVE FOR ENGINE COOLING WATER, UNDILUTED SOLUTION FOR ENGINE COOLING WATER, AND ENGINE COOLING WATER

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an additive for engine cooling water preventing a deterioration of a rust-preventive agent in engine cooling water by a far infrared radiation effect and inducing a rust-preventive effect an undiluted solution for engine cooling water, and engine cooling water.

SOLUTION: This engine cooling water uses as engine cooling water, activated water to which nonfreezing ethylene glycol and rocks with a mean particle diameter crushed to 10  $\mu\text{m}$  or below irradiated with far infrared ray are applied. Thereby, water is electrolyzed into  $\text{H}^+$  ions and  $\text{OH}^-$  ions by a momentary reaction between rocks and water. a hydrogen ion film is formed on the surface of a pipe wall by the activated  $\text{H}^+$  ions, contact with corrosive gas such as dissolved oxygen and residual chlorine in water can be prevented, and oxidation corrosion can be prevented.



## LEGAL STATUS

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CLAIMS

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[Claim(s)]

[Claim 1]

Activation water with which a part of water molecule was ionized.

It has the rock by which the far infrared rays with which mean particle diameter mixed in this activation water was \*\*\*\*(ed) by 10 micrometers or less are emitted.

The additive for engine cooling water characterized by things.

[Claim 2]

It is the natural rock by which said rock uses SiO<sub>2</sub> and aluminum 2O<sub>3</sub> as a principal component, and carries out little content of Fe 2O<sub>3</sub>, Na<sub>2</sub>O, K<sub>2</sub>O, MgO, and others.

The additive for engine cooling water according to claim 1 characterized by things.

[Claim 3]

It is 1200 degrees or more and said rock was formed into the baking ceramic.

The additive for engine cooling water according to claim 1 or 2 characterized by things.

[Claim 4]

Addition liquid for giving nonfreezing to the cooling water with which a part of water molecule was ionized.

It has the rock by which the far infrared rays with which mean particle diameter mixed in this addition liquid was \*\*\*\*(ed) by 10 micrometers or less are emitted.

The undiluted solution for engine cooling water characterized by things.

[Claim 5]

It is the natural rock by which said rock uses SiO<sub>2</sub> and aluminum 2O<sub>3</sub> as a principal component, and carries out little content of Fe 2O<sub>3</sub>, Na<sub>2</sub>O, K<sub>2</sub>O, MgO, and others.

The undiluted solution for engine cooling water according to claim 4 characterized by things.

[Claim 6]

It is 1200 degrees or more and said rock was formed into the baking ceramic.

The undiluted solution for engine cooling water according to claim 4 or 5 characterized by things.

[Claim 7]

Activation water with which a part of water molecule was ionized.

The rock by which the far infrared rays with which mean particle diameter mixed in this activation water was \*\*\*\*(ed) by 10 micrometers or less are emitted.

It has the antifreezing solution mixed in said activation water.

Engine cooling water characterized by things.

[Claim 8]

It is the natural rock by which said rock uses SiO<sub>2</sub> and aluminum 2O<sub>3</sub> as a principal component, and carries out little content of Fe 2O<sub>3</sub>, Na<sub>2</sub>O, K<sub>2</sub>O, MgO, and others.

Engine cooling water according to claim 8 characterized by things.

[Claim 9]

It is 1200 degrees or more and said rock was formed into the baking ceramic.

Engine cooling water according to claim 8 or 9 characterized by things.

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[Translation done.]

## DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]

This invention relates to engine cooling water that the undiluted solution list for the additive for engine cooling water, and engine cooling water. Engine cooling water is started at the undiluted solution list for the additive for engine cooling water, and engine cooling water which circulates the inside of a radiator as an object for cooling of engines, such as an automobile, a marine vessel, and a generator, in detail and which was excellent in the rust-proofing effectiveness.

[0002]

[Description of the Prior Art]

In order to keep constant the temperature of the engine which repeats combustion and explosion at an elevated temperature, the cooling water used with the water-cooled mold engine carried in a car, a marine vessel, a generator, etc. carries out heat dissipation cooling of the heat of a combustion chamber which received cooling water outside immediately through and here with another radiator, and is made to circulate through it again conventionally.

[0003]

then, what blended ethylene glycol as the antifreezing solution on the need of suppress generating of the rust by raise thermal conductivity in order to fully demonstrate the function of cooling water, or prevent freezing, and circulate through internal channels, such as iron and aluminum, over long duration, and blended the phosphate system matter, a defoaming agent, etc. as a rust-proofer, and the so-called LLC (long life coolant liquid) be dilute with water, and it be consider as engine cooling water.

[0004]

Here, a metal combines with oxygen and corrosive action is cut, combines the phosphate as a rust-proofer with a metal more strongly than oxygen, and intercepts association with oxygen by generating a rust-proofing coat to a surface of metal.

[0005]

However, degradation of a rust-proofer being removed from a surface of metal arises as it circulates through internal channels, such as iron and aluminum, over a long period of time, and the problem on which corrosion advances arises from there. If a rust-proofer is newly added at this time, although progress of corrosion is a pile stop \*\*\*\* thing, it will also become the cause of separating by degradation of the rust-proofer thrown in in early stages, and precipitating. Moreover, it combines with a part for calcium, and phosphate becomes calcium phosphate, serves as a lifting and cone matter in precipitate, and also becomes the cause of pecking a radiator.

[0006]

Therefore, for the cooling water polluted with the sediment and the chemical of rust and a scale although the actual condition was exchanging every year [about] by the business-use car, and having exchanged cooling water in the private vehicle every about two years, become industrial waste, and processing cost becomes high in this processing, or the problem which is not desirable is \*\* on an environment.

[0007]

Then, the process which forms supply coolant liquid and a used coolant reservoir in order to rework without discarding said polluted cooling water, The process which operates feeding structure, and supply coolant liquid is moved [process] into a coolant path from the source of a coolant, and makes a used coolant flow into reservoir structure from a coolant path by this, a used coolant is processed chemically, a metal and other contaminations are removed from a coolant, and there is a method of having the process which makes processed coolant liquid usable as supply coolant liquid by this (patent reference 1 reference --).

[0008]

[Patent reference 1]

JP,6-167217,A (refer to epitome.)

[0009]

[Problem(s) to be Solved by the Invention]

However, by the approach of reworking said cooling water, there is a problem which the equipment which processes the used coolant liquid in a reservoir chemically, and removes a metal or other contaminations from used coolant liquid is needed, and must spend time amount on the reprocessing.

Furthermore, a rust-proofer and the antifreezing solution must be again fed into the cooling water which carried out reprocessing, and there is a problem which serves as the cost high by the charge of rework and new coolant liquid.

[0010]

This invention aims at providing with engine cooling water the undiluted solution list for the additive for engine cooling water, and engine cooling water which occurs the rust-proofing effectiveness while it is originated in view of the above point and it prevents degradation of the rust-proofer in engine cooling water according to a far-infrared operation.

[0011]

[Means for Solving the Problem]

In order to attain the above-mentioned object, the additive for engine cooling water concerning this invention is equipped with the activation water with which a part of water molecule was ionized, and the rock by which the far infrared rays with which mean particle diameter mixed in this activation water was \*\*\*\*(ed) by 10 micrometers or less are emitted.

[0012]

Although an ordinary waterworks may be used as it is, generally the water used for engine cooling uses the ethylene glycol for giving nonfreezing to water as a principal component, dilutes with a waterworks the undiluted solution for engine cooling water which blended the rust-proofer and \*\*\*\* agent for giving this anti-corrosiveness, and is used as engine cooling water. The dilution ratio in this case changes according to the atmospheric temperature of the water for every area, for example, in the case of the Kyushu district, it is the rate of the water 60:undiluted solution 40 in general.

[0013]

Here the additive for engine cooling water of this invention By adding to the engine cooling water with which said nonfreezing and

anti-corrosiveness were given Water is electrolyzed into  $H^+$  ion and  $OH^-$  ion by the momentary reaction of the rock and water by which the far infrared rays \*\*\*\*(ed) by 10 micrometers or less are emitted. Activated  $H^+$  ion forms a hydrogen ion coat on the surface of a tube wall, prevents contact to corrosive gas, such as underwater dissolved oxygen and residual chlorine, and prevents oxidation corrosion.

[0014]

With moreover, the activation water with which a part of water molecule was ionized The activation water with which high voltage direct current electrostatic potential is added to water, and a part of water molecule is ionized. The activation water with which a part of water molecule is ionized by contacting water in the mineral which emits far infrared rays. Or there is activation water by which a part of water molecule is ionized with the energy generated when water crosses at a right angle to line of magnetic force. It works on underwater ion with the energy by magnetism or far infrared rays, ionization of water is promoted, and the low water ensemble of the activation which wore the charge of minus till then will be in the high condition of the activation by which it was plus electrified. In this activation water, the activity of algae, a fungus, etc. is also inactivated and effectiveness, such as a scum, and control, clearance of scale slime, can be acquired.

[0015]

Therefore, ionization of engine cooling water will be promoted, the ethylene glycol as the antifreezing solution contained in engine cooling water by this and degradation of a rust-proofer and a \*\*\*\* agent are prevented, and maintaining the rust-proofing effectiveness according to the synergistic effect of activation water and the powder rock by which far infrared rays are emitted, is continued.

[0016]

Moreover, the undiluted solution for engine cooling water concerning this invention is equipped with the rock by which the far infrared rays with which mean particle diameter mixed in the addition liquid and this addition liquid for giving nonfreezing to the cooling water with which a part of water molecule was ionized was \*\*\*\*(ed) by 10 micrometers or less are emitted.

[0017]

Here, the undiluted solution for engine cooling water of this invention is activated so that the molecule of ethylene glycol may ionize as the antifreezing solution, and it uses as the undiluted solution for engine cooling water what mixed the rock by which the far infrared rays with which the mean diameter was \*\*\*\*(ed) by 10 micrometers or less to this undiluted solution are emitted.

By diluting this undiluted solution for engine cooling water with a waterworks, and using it as engine cooling water (water 60: in for example, the case of the Kyushu district in general the undiluted solution 40 comparatively) Water is electrolyzed into  $H^+$  ion and  $OH^-$  ion by the momentary reaction of the rock and water by which the far infrared rays \*\*\*\*(ed) by 10 micrometers or less are emitted. Activated  $H^+$  ion forms a hydrogen ion coat in a front face at a tube wall, prevents contact to corrosive gas, such as underwater dissolved oxygen and residual chlorine, and prevents oxidation corrosion.

[0018]

Furthermore, it works on underwater ion with the energy by magnetism or far infrared rays, and ionization of water is promoted, and ionization of engine cooling water will be promoted by the synergistic effect of the activation water plus electrified and the powder rock by which far infrared rays are emitted, and the low water ensemble of the activation which wore the charge of minus till then prevents degradation of the antifreezing solution contained in engine cooling water by this, and becomes possible [ continuing maintaining the rust-proofing effectiveness ].

[0019]

Moreover, the engine cooling water concerning this invention is equipped with the activation water with which a part of water molecule was ionized, and the rock by which the far infrared rays with which mean particle diameter mixed in this activation water was \*\*\*\*(ed) by 10 micrometers or less are emitted in the addition liquid for giving nonfreezing to cooling water.

[0020]

The engine cooling water of this invention here by using the activation water with which the rock by which the far infrared rays with which the ethylene glycol and mean particle diameter as nonfreezing were \*\*\*\*(ed) by 10 micrometers or less are emitted was given as engine cooling water Water is electrolyzed into  $H^+$  ion and  $OH^-$  ion by the momentary reaction of the rock and water by which the far infrared rays \*\*\*\*(ed) by 10 micrometers or less are emitted. Activated  $H^+$  ion forms a hydrogen ion coat in a front face at a tube wall, prevents contact to corrosive gas, such as dissolved oxygen and residual chlorine, and prevents oxidation corrosion.

[0021]

Furthermore, ionization of engine cooling water will be promoted by the synergistic effect of activation water and rock powder, degradation of the antifreezing solution contained in engine cooling water by this is prevented, and it becomes possible to continue maintaining the rust-proofing effectiveness.

[0022]

The effect by the blinding in equipment or wear does not occur without powder precipitating within a circulation cooling system by \*\*\*\*(ing) particle size of the rock used here to 10 micrometers or less. Moreover, by considering as impalpable powder, surface area increases and the radiant efficiency of far infrared rays also becomes high.

In addition, when particle size of a rock is set to 0.2 micrometers or less, it becomes colloid, and it does not precipitate at all and the electrolysis effectiveness by the reaction with water becomes very high.

[0023]

[Embodiment of the Invention]

Hereafter, the gestalt of operation of this invention is explained taking a drawing into consideration, and an understanding of this invention is presented with it.

[0024]

The additive for engine cooling water which applied this invention serves as the activation water 4 with which a part of water molecule was ionized by circulating compulsorily the waterworks contained in a tank 2 as shown in drawing 1 through activation equipment 1 with a pump 3.

This activation equipment grinds "\*\*\*\*\*" as the tourmaline and far-infrared emission as electrical energy emission, and it is equipment with a particle size of about 3-10mm sintered spherically, and by the inside of this equipment contacting a waterworks or ethylene glycol compulsorily, according to electrical energy and a far-infrared operation, a part of water molecule is ionized inside a cylindrical cup, and it is activated.

[0025]

It is desirable although the natural rock which uses SiO<sub>2</sub> and aluminum 2O<sub>3</sub> as a principal component, and carries out little content of Fe 2O<sub>3</sub>, Na<sub>2</sub>O, K<sub>2</sub>O, MgO, and others as a rock which emits far infrared rays is used. The rock called "\*\*\*\*\*" as a natural rock of such a component by the thermal denaturation rock produced, for example by the Higashi-Usuki, Miyazaki County is known. It is thought that this "\*\*\*\*\*" was generated by volcanic activity, and little examples of analysis, such as K<sub>2</sub>O:2.5%, MgO:2.4%, other CaO, TiO<sub>2</sub> and MnO(s), and P<sub>2</sub>O<sub>5</sub>, are acquired as an example of a presentation SiO<sub>2</sub>:68.9%, aluminum 2O<sub>3</sub>:13.8%, Fe<sub>2</sub>O<sub>3</sub>:5.2%, and Na<sub>2</sub>O:3.6%.

[0026]

And the rock of said presentation is formed into a baking ceramic at 1200 degrees C, and it considers as the far-infrared radiation powder which ground this to the ultrafine particle with a particle size of 0.5 micrometers. Here, it becomes possible by forming a rock into a baking ceramic at 1200 degrees C to acquire the effectiveness which far-infrared radiation powder stops being able to oxidize easily, and component change does not take place by this, but continues far-infrared radiation in eternal. Moreover, the effect by the blinding into equipment or wear does not occur, without the far-infrared powder of a precipitation condition floating into liquid at the time of engine start up, and being able to perform homogeneous mixing to cooling water within the circulation cooling system formed in the perimeter of an engine, and precipitating by considering as far-infrared powder with a particle size of 0.5 micrometers.

[0027]

Then, said far-infrared radiation powder is mixed in the addition liquid which activated the waterworks with said activation equipment. That is, the rate of mixing of the far-infrared radiation powder in engine cooling water serves as range where 0.05 - 0.1 % of the weight is desirable, the effectiveness of the improvement in combustion efficiency by this rate of mixing being less than 0.05% is not acquired, but effectiveness will be saturated even if it makes it mix across 0.1 % of another side. It follows, for example, is usually about 4000 cc - about 8000 cc of amount of water of the engine cooling water of an automobile, and when the rate of mixing of far-infrared radiation powder is made into 0.05 % of the weight, amount of water is set to 8000x0.05%=4g by 8000 cc. Moreover, when the rate of mixing of far-infrared radiation powder is made into 0.1 % of the weight, amount of water serves as a 8000gx0.1%=8g formula in 8000 cc.

[0028]

Moreover, as the ethylene glycol as the antifreezing solution was mentioned above in drawing 1, a molecule ionizes and activates the undiluted solution for engine cooling water which applied this invention by carrying out circulation contact compulsorily through activation equipment 1. And the rate of mixing of the far-infrared radiation powder mentioned above to this antifreezing solution (% of the weight) is made into x (0.05-0.1) (dilution scale factor of an undiluted solution).

[0029]

Here, the dilution scale factor of an undiluted solution points out the dilution scale factor in the case of diluting the undiluted solution for engine cooling water of this invention with a waterworks as cooling water of an automobile engine. As this dilution scale factor was mentioned above, it changes according to the atmospheric temperature of the winter for every area, for example, in the case of the Kyushu district, is the rate (dilution ratio 2.5) of the water 60undiluted solution 40 in general. Therefore, in the case of the Kyushu district, the rate of mixing of the far-infrared radiation powder to an undiluted solution becomes with the range where 0.0025 - 0.25 % of the weight is desirable. By making far-infrared radiation powder mix in this range, when an undiluted solution is diluted 2.5 times, the rate of mixing of the far-infrared radiation in cooling water becomes 0.05 - 0.1 % of the weight.

[0030]

Moreover, the engine cooling water which applied this invention sets to about 7:3 the mixed rate of the activation water activated compulsorily through the waterworks by the activation equipment 1 mentioned above in drawing 1, and the ethylene glycol as the antifreezing solution, and makes the rate of mixing of far-infrared radiation powder 0.05 - 0.1 % of the weight to the mixed liquor of this activation water and ethylene glycol.

In addition, the same effectiveness can be acquired even when activated compulsorily through the mixed liquor of a waterworks and ethylene glycol to activation equipment.

[0031]

As long as the waterworks, such as ionizing a part, and the antifreezing solution of a water molecule are activable with the energy generated when water crosses at a right angle to line of magnetic force with the magnet which activation equipment not necessarily grinds "\*\*\*\*\*" as the tourmaline and far-infrared emission as electrical energy emission, and the need of being equipment with a particle size of about 3-10mm sintered spherically does not have here, for example, was formed in the pipe, you may be what kind of thing.

[0032]

Moreover, even when there is nothing and atmospheric temperature falls below the freezing point like winter or a cold district, if it does not have an adverse effect on an environment like alcohol, it is [ that what is necessary is just that in which engine cooling water does not freeze over ] much more desirable [ the need that the antifreezing solution is not necessarily ethylene glycol ].

[0033]

Next, the rust prevention of engine cooling water is explained to the undiluted solution list for the additive for engine cooling water, and engine cooling water which applied this invention to drawing 2.

The water and the far-infrared radiation powder in the circulation cooling pipe 5 react momentarily, and water causes electrolysis. The science type when causing this electrolysis is  $H_2O \rightarrow H^+ + OH^-$ , and hydrogen will occur.

[0034]

This hydrogen gas will remove the so-called rust with which the metal tubing front face oxidized, will become still more active [ a hydrogen ion (H<sup>+</sup>) ], and will form a hydrogen ion coat in a tube wall side. It becomes possible for this hydrogen ion coat to protect contact to corrosive gas, such as underwater dissolved oxygen and residual chlorine, and \*\*\*\*\* , and to prevent generating of the rust by oxidation.

[0035]

Moreover, underwater, a hydroxide ion (OH<sup>-</sup>) occurs in a large quantity, PH increases by this and an anion called hydroxyl ion (HO<sub>2</sub><sup>-</sup>) occurs. Thereby, engine cooling water is denaturalizing in weak ARUKARU ion water without the activated impurity. degradation of a rust-proofer and the antifreezing solution is prevented and the stable rust-proofing effectiveness is made to maintain with the additive for engine cooling water.

[0036]

Furthermore, while preventing degradation of the antifreezing solution, the synergistic effect of activation water and far-infrared radiation powder protects clearance of rust, and generating of rust, and the stable rust-proofing effectiveness is made to maintain in the undiluted solution for engine cooling water, and engine cooling water.

[0037]

Moreover, in drawing 3 and drawing 4, other operation effectiveness by this invention is explained.

The circulation cooling pipe 5 internal-surface side prepared in the engine cylinder block 6 serves as an anode plate with a hydrogen ion, as mentioned above.

Since the oxygen in the gaseous mixture of the gasoline inhaled in the cylinder combustion chamber 7 on the other hand and air is an anion, the inside of the cylinder combustion chamber 7 serves as cathode. Consequently, a current arises from the circulation cooling pipe 5 side into the cylinder combustion chamber 7, and with this electrical energy, high-speed molecular motion is subdivided in the mixed gas in the cylinder combustion chamber 7, and it subdivides the cluster of the gaseous mixture to all the corners in a lifting and the cylinder combustion chamber 7 in an instant. It is expected that the mixed gas in this subdivided cylinder combustion chamber 7 becomes easy to burn, and combustion efficiency increases.

[0038]

Then, the undiluted solution for engine cooling water of this invention mentioned above was diluted with the waterworks 2.5 times, and the fuel consumption after an average of 1,200km transit of Nissan Primera (gasoline-powered vehicle) moons in the case where it pours in as engine cooling water with a displacement of 1990 cc, and the case where a commercial long life coolant is used as it was as an undiluted solution for engine cooling water was measured. The measurement result is shown in a table 1.

[0039]

[A table 1]

注入前平均	7. 7 5 km/l
注入後平均	8. 9 5 km/l
向 上 率	1 5. 5 2 %

[0040]

After pouring in the undiluted solution for engine cooling water of this invention from the measurement result of a table 1, with the average for one month, 8.94% of elongation is shown, and after two months, if it guesses from 15.52% and large elongation being shown also with the average for 18.17% and two months, six months after, that out of which 25% or more of improvement effect comes can be presumed.

[0041]

Moreover, the result of having measured exhaust gas \*\*\*\*\* of CO<sub>2</sub> (carbon dioxide), CO (carbon monoxide), HC (hydrocarbon), and NO<sub>x</sub> (nitrogen oxides) in the exhaust gas at the time of the idling of the engine after pouring in the undiluted solution for engine cooling water of this invention and per minute 1,500 revolution with the subcompact used in a table 1 is shown in a table 2.

[0042]

[A table 2]

項 目	アイドリング時	1, 500回転/分
CO <sub>2</sub> (二酸化炭素)	30. 0 %	36. 3 %
CO (一酸化炭素)	18. 2 %	56. 0 %
HC (炭化水素)	56. 0 %	70. 5 %
NO <sub>x</sub> (窒素酸化物)	14. 1 %	57. 5 %

[0043]

\*\*\*\*\* of the various exhaust gas at the time of an idling are 2= 30.0% of CO<sub>2</sub>, CO=18.2%, HC=56.0%, and NO<sub>x</sub>=14.1%, and serve as 2= 36.3% of CO<sub>2</sub>, CO=56.0%, HC=70.5%, NO<sub>x</sub>=57.5%, and improvement in \*\*\*\*\* of various large exhaust gas from the measurement result of a table 2 in the time of per minute 1,500 revolution (at the time of transit). It became clear that the depressor effect of the harmful exhaust gas at the time of transit could be acquired by this result.

Moreover, as for various kinds, the discharge of exhaust gas is decreasing by the depressor effect of fuel consumption, and since it is thought that control also with the discharge of PM (particulate matter) equivalent to the part (15% or more) by which fuel consumption has been improved is carried out even if it sees from the coking condition of an exhaust pipe, although measurement has not been carried out, it is surmised that the same result also as the demonstration in a diesel rolling stock will be obtained from now on.

[0044]

In addition, although the undiluted solution for engine cooling water of this invention was used in the comparative experiments in said table 1 - a table 3, even when the additives for engine cooling water and engine cooling water of this invention other than this undiluted solution for engine cooling water were used, the almost same measurement result was able to be obtained.

[0045]

[Effect of the Invention]

As stated above, after activating the undiluted solution for engine cooling water or engine cooling water for giving addition liquid

or nonfreezing according to this invention, by making the powder which \*\*\*\*(ed) the rock which emits far infrared rays in mean particle diameter of 10 micrometers or less mix, according to the synergistic effect with activation water, a hydrogen ion coat is formed in a cooling pipe internal surface, and clearance and the prolonged rust-proofing effectiveness of rust are acquired. [0046]

By using the powder which \*\*\*\*(ed) the natural rock which used SiO<sub>2</sub> and aluminum 2O<sub>3</sub> as the principal component as far-infrared radiation powder in mean particle diameter of 10 micrometers or less The effect by the blinding in equipment or wear does not occur without the increment in surface area being able to raise the radiant efficiency of far infrared rays, and there being few required amounts of mixing to cooling water, ending by this, and being able to perform homogeneous mixing to cooling water, and precipitating within a circulation cooling system. [0047]

Moreover, a current arises to a cylinder combustion chamber with a hydrogen ion in a cooling pipe internal surface, and with this electrical energy, high-speed molecular motion is subdivided in the mixed gas of a cylinder combustion chamber, and it subdivides the cluster of the gaseous mixture to all the corners of a lifting and a cylinder combustion chamber in an instant. When the mixed gas of this subdivided cylinder combustion chamber becomes easy to burn and combustion efficiency increases, the effectiveness that the improvement in fuel consumption and harmful exhaust gas decrease remarkably is acquired.

[Brief Description of the Drawings]

[Drawing 1] It is the explanatory view showing an example of the generation method of the activation water in this invention.

[Drawing 2] It is the explanatory view showing the rust prevention of this invention.

[Drawing 3] It is the explanatory view showing the outline of a water cooling type engine.

[Drawing 4] It is a partial amplification explanatory view in drawing 3.

[Description of Notations]

1 Activation Equipment

2 Tank

3 Pump

4 Activation Water

5 Circulation Cooling Pipe

6 Cylinder Block

7 Cylinder Combustion Chamber

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[Translation done.]

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TECHNICAL FIELD

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## [Field of the Invention]

This invention relates to engine cooling water at the undiluted solution list for the additive for engine cooling water, and engine cooling water. Engine cooling water is started at the undiluted solution list for the additive for engine cooling water, and engine cooling water which circulates the inside of a radiator as an object for cooling of engines, such as an automobile, a marine vessel, and a generator, in detail and which was excellent in the rust-proofing effectiveness.

[0002]

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[Translation done.]



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PRIOR ART

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## [Description of the Prior Art]

In order to keep constant the temperature of the engine which repeats combustion and explosion at an elevated temperature, the cooling water used with the water-cooled mold engine carried in a car, a marine vessel, a generator, etc. carries out heat dissipation cooling of the heat of a combustion chamber which received cooling water outside immediately through and here with another radiator, and is made to circulate through it again conventionally.

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then, what blended ethylene glycol as the antifreezing solution on the need of suppress generating of the rust by raise thermal conductivity in order to fully demonstrate the function of cooling water, or prevent freezing, and circulate through internal channels, such as iron and aluminum, over long duration, and blended the phosphate system matter, a defoaming agent, etc. as a rust-proofer, and the so-called LLC ( long life coolant liquid ) be dilute with water, and it be consider as engine cooling water.

[0004]

Here, a metal combines with oxygen and corrosive action is cut, combines the phosphate as a rust-proofer with a metal more strongly than oxygen, and intercepts association with oxygen by generating a rust-proofing coat to a surface of metal.

[0005]

However, degradation of a rust-proofer being removed from a surface of metal arises as it circulates through internal channels, such as iron and aluminum, over a long period of time, and the problem on which corrosion advances arises from there. If a rust-proofer is newly added at this time, although progress of corrosion is a pile stop \*\*\*\* thing, it will also become the cause of separating by degradation of the rust-proofer thrown in in early stages, and precipitating. Moreover, it combines with a part for calcium, and phosphate becomes calcium phosphate, serves as a lifting and cone matter in precipitate, and also becomes the cause of packing a radiator.

[0006]

Therefore, for the cooling water polluted with the sediment and the chemical of rust and a scale although the actual condition was exchanging every year [ about ] by the business-use car, and having exchanged cooling water in the private vehicle every about two years, become industrial waste, and processing cost becomes high in this processing, or the problem which is not desirable is \*\* on an environment.

[0007]

Then, the process which forms supply coolant liquid and a used coolant reservoir in order to rework without discarding said polluted cooling water, The process which operates feeding structure, and supply coolant liquid is moved [ process ] into a coolant path from the source of a coolant, and makes a used coolant flow into reservoir structure from a coolant path by this, a used coolant is processed chemically, a metal and other contaminations are removed from a coolant, and there is a method of having the process which makes processed coolant liquid usable as supply coolant liquid by this (patent reference 1 reference --).

[0008]

[Patent reference 1]

JP,6-167217.A (refer to epitome.)

[0009]

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[Translation done.]

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EFFECT OF THE INVENTION

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## [Effect of the Invention]

As stated above, after activating the undiluted solution for engine cooling water or engine cooling water for giving addition liquid or nonfreezing according to this invention, by making the powder which \*\*\*\*(ad) the rock which emits far infrared rays in mean particle diameter of 10 micrometers or less mix, according to the synergistic effect with activation water, a hydrogen ion coat is formed in a cooling pipe internal surface, and clearance and the prolonged rust-proofing effectiveness of rust are acquired.

[0046]

By using the powder which \*\*\*\*(ad) the natural rock which used SiO<sub>2</sub> and aluminum 2O<sub>3</sub> as the principal component as far-infrared radiation powder in mean particle diameter of 10 micrometers or less The effect by the blinding in equipment or wear does not occur without the increment in surface area being able to raise the radiant efficiency of far infrared rays, and there being few required amounts of mixing to cooling water, ending by this, and being able to perform homogeneous mixing to cooling water, and precipitating within a circulation cooling system.

[0047]

Moreover, a current arises to a cylinder combustion chamber with a hydrogen ion in a cooling pipe internal surface, and with this electrical energy, high-speed molecular motion is subdivided in the mixed gas of a cylinder combustion chamber, and it subdivides the cluster of the gaseous mixture to all the corners of a lifting and a cylinder combustion chamber in an instant. When the mixed gas of this subdivided cylinder combustion chamber becomes easy to burn and combustion efficiency increases, the effectiveness that the improvement in fuel consumption and harmful exhaust gas decrease remarkably is acquired.

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[Translation done.]

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TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention]

However, by the approach of reworking said cooling water, there is a problem which the equipment which processes the used coolant liquid in a reservoir chemically, and removes a metal or other contaminations from used coolant liquid is needed, and must spend time amount on the reprocessing.

Furthermore, a rust-proofer and the antifreezing solution must be again fed into the cooling water which carried out reprocessing, and there is a problem which serves as the cost high by the charge of rework and new coolant liquid.  
[0010]

This invention aims at providing with engine cooling water the undiluted solution list for the additive for engine cooling water, and engine cooling water which occurs the rust-proofing effectiveness while it is originated in view of the above point and it prevents degradation of the rust-proofer in engine cooling water according to a far-infrared operation.  
[0011]

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[Translation done.]

## MEANS

## [Means for Solving the Problem]

In order to attain the above-mentioned object, the additive for engine cooling water concerning this invention is equipped with the activation water with which a part of water molecule was ionized, and the rock by which the far infrared rays with which mean particle diameter mixed in this activation water was \*\*\*\*(ed) by 10 micrometers or less are emitted.

[0012]

Although an ordinary waterworks may be used as it is, generally the water used for engine cooling uses the ethylene glycol for giving nonfreezing to water as a principal component, dilutes with a waterworks the undiluted solution for engine cooling water which blended the rust-proofer and \*\*\*\* agent for giving this anti-corrosiveness, and is used as engine cooling water. The dilution ratio in this case changes according to the atmospheric temperature of the water for every area, for example, in the case of the Kyushu district, it is the rate of the water 60undiluted solution 40 in general.

[0013]

Here the additive for engine cooling water of this invention By adding to the engine cooling water with which said nonfreezing and anti-corrosiveness were given Water is electrolyzed into H<sup>+</sup> ion and OH<sup>-</sup> ion by the momentary reaction of the rock and water by which the far infrared rays \*\*\*\*(ed) by 10 micrometers or less are emitted. Activated H<sup>+</sup> ion forms a hydrogen ion coat on the surface of a tube wall, prevents contact to corrosive gas, such as underwater dissolved oxygen and residual chlorine, and prevents oxidation corrosion.

[0014]

With moreover, the activation water with which a part of water molecule was ionized The activation water with which high voltage direct current electrostatic potential is added to water, and a part of water molecule is ionized. The activation water with which a part of water molecule is ionized by contacting water in the mineral which emits far infrared rays. Or there is activation water by which a part of water molecule is ionized with the energy generated when water crosses at a right angle to line of magnetic force. It works on underwater ion with the energy by magnetism or far infrared rays, ionization of water is promoted, and the low water ensemble of the activation which wore the charge of minus till then will be in the high condition of the activation by which it was plus electrified. In this activation water, the activity of algae, a fungus, etc. is also inactivated and effectiveness, such as a scum, and control, clearance of scale slime, can be acquired.

[0015]

Therefore, ionization of engine cooling water will be promoted, the ethylene glycol as the antifreezing solution contained in engine cooling water by this and degradation of a rust-proofer and a \*\*\*\* agent are prevented, and maintaining the rust-proofing effectiveness according to the synergistic effect of activation water and the powder rock by which far infrared rays are emitted, is continued.

[0016]

Moreover, the undiluted solution for engine cooling water concerning this invention is equipped with the rock by which the far infrared rays with which mean particle diameter mixed in the addition liquid and this addition liquid for giving nonfreezing to the cooling water with which a part of water molecule was ionized was \*\*\*\*(ed) by 10 micrometers or less are emitted.

[0017]

Here, the undiluted solution for engine cooling water of this invention is activated so that the molecule of ethylene glycol may ionize as the antifreezing solution, and it uses as the undiluted solution for engine cooling water what mixed the rock by which the far infrared rays with which the mean diameter was \*\*\*\*(ed) by 10 micrometers or less to this undiluted solution are emitted.

By diluting this undiluted solution for engine cooling water with a waterworks, and using it as engine cooling water (water 60: in for example, the case of the Kyushu district in general the undiluted solution 40 comparatively) Water is electrolyzed into H<sup>+</sup> ion and OH<sup>-</sup> ion by the momentary reaction of the rock and water by which the far infrared rays \*\*\*\*(ed) by 10 micrometers or less are emitted. Activated H<sup>+</sup> ion forms a hydrogen ion coat in a front face at a tube wall, prevents contact to corrosive gas, such as underwater dissolved oxygen and residual chlorine, and prevents oxidation corrosion.

[0018]

Furthermore, it works on underwater ion with the energy by magnetism or far infrared rays, and ionization of water is promoted, and ionization of engine cooling water will be promoted by the synergistic effect of the activation water plus electrified and the powder rock by which far infrared rays are emitted, and the low water ensemble of the activation which wore the charge of minus till then prevents degradation of the antifreezing solution contained in engine cooling water by this, and becomes possible [ continuing maintaining the rust-proofing effectiveness ].

[0019]

Moreover, the engine cooling water concerning this invention is equipped with the activation water with which a part of water molecule was ionized, and the rock by which the far infrared rays with which mean particle diameter mixed in this activation water was \*\*\*\*(ed) by 10 micrometers or less are emitted in the addition liquid for giving nonfreezing to cooling water.

[0020]

The engine cooling water of this invention here by using the activation water with which the rock by which the far infrared rays with which the ethylene glycol and mean particle diameter as nonfreezing were \*\*\*\*(ed) by 10 micrometers or less are emitted was given as engine cooling water Water is electrolyzed into H<sup>+</sup> ion and OH<sup>-</sup> ion by the momentary reaction of the rock and water by which the far infrared rays \*\*\*\*(ed) by 10 micrometers or less are emitted. Activated H<sup>+</sup> ion forms a hydrogen ion coat in a front face at a tube wall, prevents contact to corrosive gas, such as dissolved oxygen and residual chlorine, and prevents oxidation corrosion.

[0021]

Furthermore, ionization of engine cooling water will be promoted by the synergistic effect of activation water and rock powder, degradation of the antifreezing solution contained in engine cooling water by this is prevented, and it becomes possible to continue maintaining the rust-proofing effectiveness.

[0022]

The effect by the blinding in equipment or wear does not occur without powder precipitating within a circulation cooling system by \*\*\*\*(ing) particle size of the rock used here to 10 micrometers or less. Moreover, by considering as impalpable powder,

surface area increases and the radiant efficiency of far infrared rays also becomes high.

In addition, when particle size of a rock is set to 0.2 micrometers or less, it becomes colloid, and it does not precipitate at all and the electrolysis effectiveness by the reaction with water becomes very high.

[0023]

[Embodiment of the Invention]

Hereafter, the gestalt of operation of this invention is explained taking a drawing into consideration, and an understanding of this invention is presented with it.

[0024]

The additive for engine cooling water which applied this invention serves as the activation water 4 with which a part of water molecule was ionized by circulating compulsorily the waterworks contained in a tank 2 as shown in drawing 1 through activation equipment 1 with a pump 3.

This activation equipment grinds "\*\*\*\*\*" as the tourmaline and far-infrared emission as electrical energy emission, and it is equipment with a particle size of about 3-10mm sintered spherically, and by the inside of this equipment contacting a waterworks or ethylene glycol compulsorily, according to electrical energy and a far-infrared operation, a part of water molecule is ionized inside a cylindrical cup, and it is activated.

[0025]

It is desirable although the natural rock which uses SiO<sub>2</sub> and aluminum 2O<sub>3</sub> as a principal component, and carries out little content of Fe 2O<sub>3</sub>, Na<sub>2</sub>O, K<sub>2</sub>O, MgO, and others as a rock which emits far infrared rays is used. The rock called "\*\*\*\*\*" as a natural rock of such a component by the thermal denaturation rock produced, for example by the Higashi-Utsuki, Miyazaki County is known. It is thought that this "\*\*\*\*\*" was generated by volcanic activity, and little examples of analysis, such as K<sub>2</sub>O:2.5%, MgO:2.4%, other CaO, TiO<sub>2</sub> and MnO(s), and P<sub>2</sub>O<sub>5</sub>, are acquired as an example of a presentation SiO<sub>2</sub>:66.9%, aluminum2O<sub>3</sub>:13.8%, Fe<sub>2</sub>O<sub>3</sub>:5.2%, and Na<sub>2</sub>O:3.6%.

[0026]

And the rock of said presentation is formed into a baking ceramic at 1200 degrees C, and it considers as the far-infrared radiation powder which ground this to the ultrafine particle with a particle size of 0.5 micrometers. Here, it becomes possible by forming a rock into a baking ceramic at 1200 degrees C to acquire the effectiveness which far-infrared radiation powder stops being able to oxidize easily, and component change does not take place by this, but continues far-infrared radiation in eternal. Moreover, the effect by the blinding into equipment or wear does not occur, without the far-infrared powder of a precipitation condition floating into liquid at the time of engine start up, and being able to perform homogeneous mixing to cooling water within the circulation cooling system formed in the perimeter of an engine, and precipitating by considering as far-infrared powder with a particle size of 0.5 micrometers.

[0027]

Then, said far-infrared radiation powder is mixed in the addition liquid which activated the waterworks with said activation equipment. That is, the rate of mixing of the far-infrared radiation powder in engine cooling water serves as range where 0.05 - 0.1 % of the weight is desirable, the effectiveness of the improvement in combustion efficiency by this rate of mixing being less than 0.05% is not acquired, but effectiveness will be saturated even if it makes it mix across 0.1% of another side. It follows, for example, is usually about 4000 cc - about 8000 cc of amount of water of the engine cooling water of an automobile, and when the rate of mixing of far-infrared radiation powder is made into 0.05 % of the weight, amount of water is set to 8000x0.05%=4kg by 8000 cc. Moreover, when the rate of mixing of far-infrared radiation powder is made into 0.1 % of the weight, amount of water serves as a 8000x0.1%=8g formula in 8000 cc.

[0028]

Moreover, as the ethylene glycol as the antifreezing solution was mentioned above in drawing 1, a molecule ionizes and activates the undiluted solution for engine cooling water which applied this invention by carrying out circulation contact compulsorily through activation equipment 1. And the rate of mixing of the far-infrared radiation powder mentioned above to this antifreezing solution (% of the weight) is made into x (0.05-0.1) (dilution scale factor of an undiluted solution).

[0029]

Here, the dilution scale factor of an undiluted solution points out the dilution scale factor in the case of diluting the undiluted solution for engine cooling water of this invention with a waterworks as cooling water of an automobile engine. As this dilution scale factor was mentioned above, it changes according to the atmospheric temperature of the winter for every area, for example, in the case of the Kyushu district, is the rate (dilution ratio 2.5) of the water 60undiluted solution 40 in general. Therefore, in the case of the Kyushu district, the rate of mixing of the far-infrared radiation powder to an undiluted solution becomes with the range where 0.0025 - 0.025 % of the weight is desirable. By making far-infrared radiation powder mix in this range, when an undiluted solution is diluted 2.5 times, the rate of mixing of the far-infrared radiation in cooling water becomes 0.05 - 0.1 % of the weight.

[0030]

Moreover, the engine cooling water which applied this invention sets to about 7:3 the mixed rate of the activation water activated compulsorily through the waterworks by the activation equipment 1 mentioned above in drawing 1, and the ethylene glycol as the antifreezing solution, and makes the rate of mixing of far-infrared radiation powder 0.05 - 0.1 % of the weight to the mixed liquor of this activation water and ethylene glycol.

In addition, the same effectiveness can be acquired even when activated compulsorily through the mixed liquor of a waterworks and ethylene glycol to activation equipment.

[0031]

As long as the waterworks, such as ionizing a part, and the antifreezing solution of a water molecule are activable with the energy generated when water crosses at a right angle to line of magnetic force with the magnet which activation equipment not necessarily grinds "\*\*\*\*\*" as the tourmaline and far-infrared emission as electrical energy emission, and the need of being equipment with a particle size of about 3-10mm sintered spherically does not have here, for example, was formed in the pipe, you may be what kind of thing.

[0032]

Moreover, even when there is nothing and atmospheric temperature falls below the freezing point like winter or a cold district, if it does not have an adverse effect on an environment like alcohol, it is [ that what is necessary is just that in which engine cooling water does not freeze over ] much more desirable [ the need that the antifreezing solution is not necessarily ethylene glycol ].

[0033]

Next, the rust prevention of engine cooling water is explained to the undiluted solution list for the additive for engine cooling water, and engine cooling water which applied this invention to drawing 2.

The water and the far-infrared radiation powder in the circulation cooling pipe 5 react momentarily, and water causes electrolysis. The science type when causing this electrolysis is  $H_2O \rightarrow H^+ + OH^-$ , and hydrogen will occur.

[0034]

This hydrogen gas will remove the so-called rust with which the metal tubing front face oxidized, will become still more active [ a hydrogen ion ( $H^+$ ) ], and will form a hydrogen ion coat in a tube wall side. It becomes possible for this hydrogen ion coat to protect contact to corrosive gas, such as underwater dissolved oxygen and residual chlorine, and \*\*\*\*\*, and to prevent generating of the rust by oxidation.

[0035]

Moreover, underwater, a hydroxide ion ( $OH^-$ ) occurs in a large quantity, PH increases by this and an anion called hydroxyl ion ( $H_3O_2^-$ ) occurs. Thereby, engine cooling water is denaturalizing in weak ARUKARU ion water without the activated impurity, degradation of a rust-proofer and the antifreezing solution is prevented and the stable rust-proofing effectiveness is made to maintain with the additive for engine cooling water.

[0036]

Furthermore, while preventing degradation of the antifreezing solution, the synergistic effect of activation water and far-infrared radiation powder protects clearance of rust, and generating of rust, and the stable rust-proofing effectiveness is made to maintain in the undiluted solution for engine cooling water, and engine cooling water.

[0037]

Moreover, in drawing 3 and drawing 4, other operation effectiveness by this invention is explained.

The circulation cooling pipe 5 internal-surface side prepared in the engine cylinder block 6 serves as an anode plate with a hydrogen ion, as mentioned above.

Since the oxygen in the gaseous mixture of the gasoline inhaled in the cylinder combustion chamber 7 on the other hand and air is an anion, the inside of the cylinder combustion chamber 7 serves as cathode. Consequently, a current arises from the circulation cooling pipe 5 side into the cylinder combustion chamber 7, and with this electrical energy, high-speed molecular motion is subdivided in the mixed gas in the cylinder combustion chamber 7, and it subdivides the cluster of the gaseous mixture to all the corners in a lifting and the cylinder combustion chamber 7 in an instant. It is expected that the mixed gas in this subdivided cylinder combustion chamber 7 becomes easy to burn, and combustion efficiency increases.

[0038]

Then, the undiluted solution for engine cooling water of this invention mentioned above was diluted with the waterworks 2.5 times, and the fuel consumption after an average of 1,200km transit of Nissan Primera (gasoline-powered vehicle) moons in the case where it pours in as engine cooling water with a displacement of 1990 cc, and the case where a commercial long life coolant is used as it was as an undiluted solution for engine cooling water was measured. The measurement result is shown in a table 1.

[0039]

[A table 1]

注入前平均	7. 7 5 km/l
注入後平均	8. 9 5 km/l
向 上 率	1 5. 5 2 %

[0040]

After pouring in the undiluted solution for engine cooling water of this invention from the measurement result of a table 1, with the average for one month, 8.94% of elongation is shown, and after two months, if it guesses from 15.52% and large elongation being shown also with the average for 18.17% and two months, six months after, that out of which 25% or more of improvement effect comes can be presumed.

[0041]

Moreover, the result of having measured exhaust gas \*\*\*\*\* of CO<sub>2</sub> (carbon dioxide), CO (carbon monoxide), HC (hydrocarbon), and NO<sub>x</sub> (nitrogen oxides) in the exhaust gas at the time of the idling of the engine after pouring in the undiluted solution for engine cooling water of this invention and per minute 1,500 revolution with the subcompact used in a table 1 is shown in a table 2.

[0042]

[A table 2]

項 目	アイドリング時	1, 5 0 0 回転/分
C O <sub>2</sub> (二酸化炭素)	3 0. 0 %	3 6. 3 %
C O (一酸化炭素)	1 8. 2 %	5 6. 0 %
H C (炭化水素)	5 6. 0 %	7 0. 5 %
N O <sub>x</sub> (窒素酸化物)	1 4. 1 %	5 7. 5 %

[0043]

\*\*\*\*\* of the various exhaust gas at the time of an idling are 2= 30.0% of COs, CO=18.2%, HC=56.0%, and NOx=14.1%, and serve as 2= 36.3% of COs, CO=56.0%, HC=70.5%, NOx=57.5%, and improvement in \*\*\*\*\* of various large exhaust gas from the measurement result of a table 2 in the time of per minute 1,500 revolution (at the time of transit). It became clear that the depressor effect of the harmful exhaust gas at the time of transit could be acquired by this result.

Moreover, as for various kinds, the discharge of exhaust gas is decreasing by the depressor effect of fuel consumption, and since it is thought that control also with the discharge of PM (particulate matter) equivalent to the part (15% or more) by which fuel consumption has been improved is carried out even if it sees from the coking condition of an exhaust pipe, although measurement has not been carried out, it is surmised that the same result also as the demonstration in a diesel rolling stock will be obtained from now on.

[0044]

In addition, although the undiluted solution for engine cooling water of this invention was used in the comparative experiments in said table 1 - a table 3, even when the additives for engine cooling water and engine cooling water of this invention other than this undiluted solution for engine cooling water were used, the almost same measurement result was able to be obtained.

[0045]

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[Translation done.]

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DESCRIPTION OF DRAWINGS

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## [Brief Description of the Drawings]

[Drawing 1] It is the explanatory view showing an example of the generation method of the activation water in this invention.

[Drawing 2] It is the explanatory view showing the rust prevention of this invention.

[Drawing 3] It is the explanatory view showing the outline of a water cooling type engine.

[Drawing 4] It is a partial amplification explanatory view in drawing 3.

## [Description of Notations]

1 Activation Equipment

2 Tank

3 Pump

4 Activation Water

5 Circulation Cooling Pipe

6 Cylinder Block

7 Cylinder Combustion Chamber

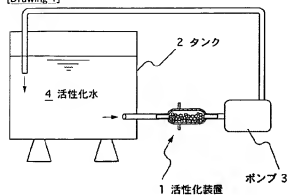
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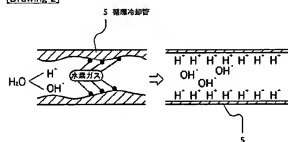


## DRAWINGS

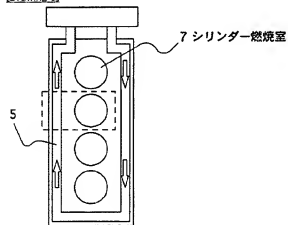
[Drawing 1]



[Drawing 2]

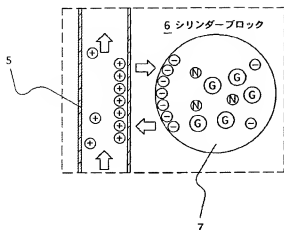


[Drawing 3]



[Drawing 4]

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[Translation done.]

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(21) 出願番号 特願2003-142095 (P2003-142095) (22) 出願日 平成15年5月20日(2003.5.20)	(71) 出願人 396003205 青木 一晃 福岡県筑紫郡那珂川町西隈242-8 (74) 代理人 100084294 弁理士 有吉 敦晴 (74) 代理人 100114627 弁理士 有吉 修一郎 (72) 発明者 青木 一晃 福岡県筑紫郡那珂川町西隈242-8 Fターム(参考) 4D037 AA08 AB18 BA17 CA04 CA05		

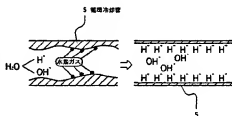
(54) 【発明の名称】 エンジン冷却水用添加剤およびエンジン冷却水用原液並びにエンジン冷却水

(57) 【要約】

【課題】本発明は、遠赤外線作用によってエンジン冷却水中の防錆剤の劣化を防ぐと共に、防錆効果を生起するエンジン冷却水用添加剤およびエンジン冷却水用原液並びにエンジン冷却水を提供することを目的とするものである。

【解決手段】本発明のエンジン冷却水は、不凍性としてのエチレングリコールと平均粒径が10 μm以下に粉砕された遠赤外線が放射される岩石が付与された活性化水を、エンジン冷却水として用いることにより、10 μm以下に粉砕された遠赤外線が放射される岩石と水との瞬間的反応により水がH<sup>+</sup>イオンとOH<sup>-</sup>イオンに電気分解され、活発化したH<sup>+</sup>イオンが管壁に表面に水素イオン皮膜を形成し、水中の溶存酸素や残留塩素などの腐食性ガスとの接触を防ぎ、酸化腐食を防止する。

【選択図】 図2



## 【特許請求の範囲】

## 【請求項1】

水分子の一部がイオン化された活性化水と、

該活性化水に混入される平均粒径が $10\mu\text{m}$ 以下に粉碎された遠赤外線が放射される岩石とを備える

ことを特徴とするエンジン冷却水用添加剤。

## 【請求項2】

前記岩石が $\text{SiO}_2$ と $\text{Al}_2\text{O}_3$ を主成分とし $\text{Fe}_2\text{O}_3$ 、 $\text{Na}_2\text{O}$ 、 $\text{K}_2\text{O}$ 、 $\text{MgO}$ その他のを少量含有する天然岩石である

ことを特徴とする請求項1記載のエンジン冷却水用添加剤。

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## 【請求項3】

前記岩石を $1200$ 度以上で焼成セラミック化した

ことを特徴とする請求項1又は請求項2記載のエンジン冷却水用添加剤。

## 【請求項4】

水分子の一部がイオン化された冷却水に不凍性を付与するための添加液と、

該添加液に混入される平均粒径が $10\mu\text{m}$ 以下に粉碎された遠赤外線が放射される岩石とを備える

ことを特徴とするエンジン冷却水用原液。

## 【請求項5】

前記岩石が $\text{SiO}_2$ と $\text{Al}_2\text{O}_3$ を主成分とし $\text{Fe}_2\text{O}_3$ 、 $\text{Na}_2\text{O}$ 、 $\text{K}_2\text{O}$ 、 $\text{MgO}$ その他のを少量含有する天然岩石である

ことを特徴とする請求項4記載のエンジン冷却水用原液。

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## 【請求項6】

前記岩石を $1200$ 度以上で焼成セラミック化した

ことを特徴とする請求項4又は請求項5記載のエンジン冷却水用原液。

## 【請求項7】

水分子の一部がイオン化された活性化水と、

該活性化水に混入される平均粒径が $10\mu\text{m}$ 以下に粉碎された遠赤外線が放射される岩石と、

前記活性化水に混入される不凍液とを備える

ことを特徴とするエンジン冷却水。

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## 【請求項8】

前記岩石が $\text{SiO}_2$ と $\text{Al}_2\text{O}_3$ を主成分とし $\text{Fe}_2\text{O}_3$ 、 $\text{Na}_2\text{O}$ 、 $\text{K}_2\text{O}$ 、 $\text{MgO}$ その他のを少量含有する天然岩石である

ことを特徴とする請求項8記載のエンジン冷却水。

## 【請求項9】

前記岩石を $1200$ 度以上で焼成セラミック化した

ことを特徴とする請求項8又は請求項9記載のエンジン冷却水。

## 【発明の詳細な説明】

## 【0001】

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## 【発明の属する技術分野】

本発明はエンジン冷却水用添加剤およびエンジン冷却水用原液並びにエンジン冷却水に関する。詳しくは自動車、船舶、発電機などのエンジンの冷却用としてラジエーター内を循環させる防錆効果の優れたエンジン冷却水用添加剤およびエンジン冷却水用原液並びにエンジン冷却水に係るものである。

## 【0002】

## 【従来の技術】

従来、車両や船舶、発電機などに搭載される水冷型エンジンで使用される冷却水は、高温で燃焼・爆発を繰り返すエンジンの温度を一定に保つために、燃焼室のすぐ外側に冷却水を通し、ここで受け取った熱を別のラジエーターで放熱冷却し、再び循環させている。

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【 0 0 0 3 】

そこで、冷却水の機能を充分に発揮させるために熱伝導率を高めたり、凍結を予防し、また鉄やアルミなどの内部水路を長時間に渡り循環することによる錆の発生を抑える必要上、不凍液としてエチレングリコール、防錆剤としてリン酸塩系物質および消泡剤などを配合したものの、所謂 LLC (ロングライフクーラント液) を水で希釈してエンジンの冷却水としている。

【 0 0 0 4 】

ここで、腐食作用とは金属が酸素と結合しておきるものであり、防錆剤としてのリン酸塩は酸素より強く金属と結合し、金属表面に防錆皮膜を生成することによって酸素との結合を遮断するものである。

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【 0 0 0 5 】

しかし鉄やアルミなどの内部水路を長期間に渡り循環するにつれて防錆剤が金属表面から剥がされるなどの劣化が生じ、そこから腐食が進行する問題が生じてくる。このとき、新たに防錆剤を添加すれば腐食の進行はくい止められるものであるが、初期に投入した防錆剤の劣化により剥がれて沈殿する原因にもなる。また、リン酸塩はカルシウム分と結合してリン酸カルシウムになり、沈殿を起こしやすい物質となり、ラジエーターを詰める原因ともなる。

【 0 0 0 6 】

従って業務用車同では約 1 年ごと、自家用車では約 2 年ごとに冷却水を取り替えているのが現状であるが、錆、スケールの沈積および化学物質によって汚染された冷却水は産業廃棄物となり、この処理にあたっては処理コストが高くなる、あるいは環境上好ましくない問題がある。

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【 0 0 0 7 】

そこで前記汚染された冷却水を廃棄せずに再処理するために、供給クーラント液及び使用済クーラントリザーバを設ける工程と、圧送構造を作動させて供給クーラント液をクーラント泵からクーラント通路内へ移動し、これによって使用済クーラントをクーラント通路からリザーバ構造へ流入させる工程と、使用済クーラントを化学的に処理して金属及び他の汚染物をクーラントから除去し、これによって供給クーラント液として使用可能な処理済クーラント液をつくりだす工程とを有する方法がある (特許文献 1 参照)。

【 0 0 0 8 】

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【特許文献 1】

特開平 6 - 1 6 7 2 1 7 号公報 (要約書参照)。

【 0 0 0 9 】

【発明が解決しようとする課題】

しかしながら前記冷却水を再処理する方法では、リザーバ内の使用済クーラント液を化学的に処理して金属又は他の汚染物を使用済クーラント液から除去する装置が必要となり、またその再処理に時間を費やさなければならない問題がある。更に再処理をした冷却水に防錆剤や不凍液を再び投入しなければならず、再処理および新たなクーラント液の投入によってコスト高となる問題がある。

【 0 0 1 0 】

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本発明は、以上の点に鑑みて創案されたものであって、遠赤外線作用によってエンジン冷却水中の防錆剤の劣化を防ぐと共に、防錆効果を生起するエンジン冷却水用添加剤およびエンジン冷却水用原液並びにエンジン冷却水を提供することを目的とするものである。

【 0 0 1 1 】

【課題を解決するための手段】

上記の目的を達成するために、本発明に係るエンジン冷却水用添加剤は、水分子の一部がイオン化された活性化水と、該活性化水に混入される平均粒径が  $10 \mu\text{m}$  以下に粉碎された遠赤外線が放射される岩石とを備える。

【 0 0 1 2 】

エンジンの冷却に用いられる水は、普通の上水をそのまま用いることもあるが、一般には 50

、水に不凍性を付与するためのエチレングリコールを主成分とし、これに防食性をもたせるための防錆剤や消包剤を配合したエンジン冷却水用原液を、上水で希釈してエンジン冷却水として用いられている。この場合の希釈率は、地域ごとの冬季の気温に応じて変わり、たとえば九州地方の場合はおおむね水60：原液40の割合である。

【0013】

ここで、本発明のエンジン冷却水用添加剤は、前記不凍性および防食性が付与されたエンジン冷却水に添加することにより、 $10\mu\text{m}$ 以下に粉碎された遠赤外線が放射される岩石と水との瞬間的反応により水が $\text{H}^+$ イオンと $\text{OH}^-$ イオンに電気分解され、活発化した $\text{H}^+$ イオンが管壁の表面に水素イオン皮膜を形成し、水中の溶存酸素や残留塩素などの腐食性ガスとの接触を防ぎ、酸化腐食を防止する。

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【0014】

また、水分子の一部がイオン化された活性化水とは、水に高圧直流静電位を付加して水分子の一部がイオン化される活性化水、遠赤外線を放射する鉱物に水を接触させることによって水分子の一部がイオン化される活性化水、または磁力線に対して直角に水が横切るときに発生するエネルギーによって水分子の一部がイオン化される活性化水などがあり、磁力、あるいは遠赤外線によるエネルギーによって水中のイオンに働きかけ、水のイオン化が促進され、それまでマイナスの電荷を帯びていた活性化の低い水集団は、プラス電荷を帯びた活性化の高い状態となる。この活性化水の中では、藻類や菌類などの活動も不活性化され、水アカやスケール・スライムの抑制・除去などの効果を得ることができる。

【0015】

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従って活性化水と遠赤外線が放射される粉末岩石との相乗効果によってエンジン冷却水のイオン化が促進されることとなり、これによりエンジン冷却水に含まれる不凍液としてのエチレングリコールや防錆剤および消包剤の劣化を防止し、防錆効果を維持し続ける。

【0016】

また、本発明に係るエンジン冷却水用原液は、水分子の一部がイオン化された冷却水に不凍性を付与するための添加液と、該添加液に混入される平均粒径が $10\mu\text{m}$ 以下に粉碎された遠赤外線が放射される岩石とを備える。

【0017】

ここで、本発明のエンジン冷却水用原液は、不凍液として例えばエチレングリコールの分子がイオン化するように活性化し、この原液に対して平均粒径が $10\mu\text{m}$ 以下に粉碎され

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た遠赤外線が放射される岩石を混入したものをエンジン冷却水用原液とする。このエンジン冷却水用原液を上水で希釈してエンジン冷却水として（たとえば九州地方の場合はおおむね水60：原液40の割合）用いることにより、 $10\mu\text{m}$ 以下に粉碎された遠赤外線が放射される岩石と水との瞬間的反応により水が $\text{H}^+$ イオンと $\text{OH}^-$ イオンに電気分解され、活発化した $\text{H}^+$ イオンが管壁に表面に水素イオン皮膜を形成し、水中の溶存酸素や残留塩素などの腐食性ガスとの接触を防ぎ、酸化腐食を防止する。

【0018】

さらに、磁力、あるいは遠赤外線によるエネルギーによって水中のイオンに働きかけ、水のイオン化が促進され、それまでマイナスの電荷を帯びていた活性化の低い水集団は、プラス電荷を帯びた活性化水と遠赤外線が放射される粉末岩石との相乗効果によってエンジン冷却水のイオン化が促進されることとなり、これによりエンジン冷却水に含まれる不凍液の劣化を防止し、防錆効果を維持し続けることが可能となる。

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【0019】

また、本発明に係るエンジン冷却水は、冷却水に不凍性を付与するための添加液において、水分子の一部がイオン化された活性化水と、該活性化水に混入される平均粒径が $10\mu\text{m}$ 以下に粉碎された遠赤外線が放射される岩石とを備える。

【0020】

ここで、本発明のエンジン冷却水は、不凍性としてのエチレングリコールと平均粒径が $10\mu\text{m}$ 以下に粉碎された遠赤外線が放射される岩石が付与された活性化水を、エンジン冷却水として用いることにより、 $10\mu\text{m}$ 以下に粉碎された遠赤外線が放射される岩石と水

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との瞬間的反應により水が $H^+$ イオンと $OH^-$ イオンに電氣分解され、活発化した $H^+$ イオンが管壁に表面に水素イオン皮膜を形成し、溶存酸素や残留塩素などの腐食性ガスとの接觸を防ぎ、酸化腐食を防止する。

【0021】

さらに、活性化水と岩石粉末の相乗効果によってエンジン冷却水のイオン化が促進されることとなり、これによりエンジン冷却水に含まれる不凍液の劣化を防止し、防錆効果を維持し続けることが可能となる。

【0022】

ここで用いる岩石の粒径を $10\mu m$ 以下に粉碎することによって、循環冷却装置内で粉末が沈殿することもなく、装置内の目詰まりや摩耗による影響が発生することもない。また、微粉末とすることにより表面積が増大し、遠赤外線放射効率も高くなる。なお岩石の粒径を $0.2\mu m$ 以下とした場合にはコロイド状となり、全く沈殿することがなく、水との反応による電氣分解効率が非常に高くなる。

【0023】

【発明の実施の形態】

以下、本発明の実施の形態を図面を参照しながら説明し、本発明の理解に供する。

【0024】

本発明を適用したエンジン冷却水用添加剤は、図1に示すようにタンク2内に収納される水をポンプ3によって活性化装置1を通して強制的に循環させることによって水分子の一部がイオン化された活性化水4となる。

この活性化装置は、円筒状容器の内部に、電氣エネルギー放射物としてのトルマリンと遠赤外線放射物としての「降龍岩」を粉碎して粒径 $3\sim 10mm$ 程度の球状に焼結した装置であり、この装置内を上水あるいはエチレングリコールを強制的に接触させることによって電氣エネルギーと遠赤外線作用によって水分子の一部がイオン化されて活性化される。

【0025】

遠赤外線を放射する岩石としては、 $SiO_2$ と $Al_2O_3$ を主成分とし $Fe_2O_3$ 、 $Na_2O$ 、 $K_2O$ 、 $MgO$ その他を少量含有する天然岩石を用いるが望ましい。このような成分の天然岩石としては、たとえば宮崎県東臼杵郡で産出する熱変性岩石で「降龍岩」といわれる岩石が知られている。この「降龍岩」は、火山活動によって生成されたものと考えられており、組成例として、 $SiO_2$ :66.9%、 $Al_2O_3$ :13.8%、 $Fe_2O_3$ :5.2%、 $Na_2O$ :3.6%、 $K_2O$ :2.5%、 $MgO$ :2.4%、その他 $CaO$ 、 $TiO_2$ 、 $MnO$ 、 $P_2O_5$ など少量の分析例が得られている。

【0026】

そして前記組成の岩石を $1200^\circ C$ で焼成セラミック化し、これを粒径 $0.5\mu m$ の超微粒子に粉碎した遠赤外線放射粉末とする。ここで、岩石を $1200^\circ C$ で焼成セラミック化することにより、遠赤外線放射粉末が酸化し難くなり、これにより成分変化が起こらず遠赤外線放射を不変的に継続する効果を得ることが可能となる。

また、粒径 $0.5\mu m$ の遠赤外線粉末とすることで、エンジン始動時に沈殿状態の遠赤外線粉末が液中へ浮遊し、エンジン周囲に設けられる循環冷却装置内で冷却水への均質な混合ができ、かつ沈殿することもなく、装置内への目詰まりや摩耗による影響が発生することもない。

【0027】

そこで前記遠赤外線放射粉末を前記活性化装置によって上水を活性化した添加液に混入するものである。即ちエンジン冷却水中の遠赤外線放射粉末の混入率は $0.05\sim 0.1$ 重量%が望ましい範囲となり、この混入率が $0.05\%$ 未満であると燃焼効率向上の効果を得られず、他方 $0.1\%$ を超えて混入させても効果は飽和することになる。従って例えば普通自動車のエンジン冷却水の水量は約 $4000cc\sim 8000cc$ 位であり、遠赤外線放射粉末の混入率は $0.05$ 重量%とした場合には、水量が $8000cc$ では $8000g\times 0.05\%=4g$ となる。また、遠赤外線放射粉末の混入率は $0.1$ 重量%とした場合には、水量が $8000cc$ では $8000g\times 0.1\%=8g$ の計算式となる。

【 0 0 2 8 】

また、本発明を適用したエンジン冷却水用原液は、不凍液としてのエチレングリコールを図 1 において前述したように、活性化装置 1 を通して強制的に循環接触させることによって分子がイオン化し活性化する。そしてこの不凍液に対して前述した遠赤外線放射粉末の混入率（重量％）を、 $(0.05 \sim 0.1) \times (\text{原液の希釈倍率})$ とする。

【 0 0 2 9 】

ここで、原液の希釈倍率とは、自動車エンジンの冷却水として本発明のエンジン冷却水用原液を上水で希釈する場合の希釈倍率を指す。この希釈倍率は前述したように、地域ごとの冬季の気温に応じて変わり、たとえば九州地方の場合はおおむね水 60 : 原液 40 の割合（希釈率 2.5）である。したがって、九州地方の場合には、原液に対する遠赤外線放射粉末の混入率は、 $0.0025 \sim 0.25$  重量％が望ましい範囲となる。この範囲に遠赤外線放射粉末を混入させることにより、原液を 2.5 倍に希釈したときに冷却水中の遠赤外線放射の混入率は  $0.05 \sim 0.1$  重量％となる。

【 0 0 3 0 】

また、本発明を適用したエンジン冷却水は、図 1 において前述した活性化装置 1 に上水を強制的に通して活性化された活性化水と不凍液としてのエチレングリコールとの混合割合を約 7 : 3 とし、この活性化水とエチレングリコールとの混合液に対して遠赤外線放射粉末の混入率を  $0.05 \sim 0.1$  重量％とする。

なお、上水とエチレングリコールとの混合液を活性化装置に強制的に通して活性化する場合でも同様の効果を得ることができる。

【 0 0 3 1 】

ここで、活性化装置は必ずしも電気エネルギー放射物としてのトルマリンと遠赤外線放射物としての「降龍岩」を粉砕して粒径  $3 \sim 10$  mm 程度の球状に焼結した装置である必要は無く、例えばパイプに設けた磁石による磁力線に対して直角に水が横切る時に発生するエネルギーによって水分子の一部をイオン化するなど上水や不凍液を活性化できるものであればいかなるものであっても良い。

【 0 0 3 2 】

また、不凍液は必ずしもエチレングリコールである必要性は無く、冬季や寒冷地などのように氷点下に気温が下がった場合でもエンジン冷却水が水結しないものであれば良く、例えばアルコールのように環境に悪影響を及ぼさないものであればより一層好ましい。

【 0 0 3 3 】

次に図 2 に本発明を適用したエンジン冷却水用添加剤およびエンジン冷却水用原液並びにエンジン冷却水の防錆作用を説明する。

循環冷却管 5 内の水と遠赤外線放射粉末とが瞬間的に反応して水が電気分解を起こす。この電気分解を起こす時の科学式が  $H_2O \rightarrow H^+ + OH^-$  であり、水素が発生することとなる。

【 0 0 3 4 】

この水素ガスが金属の管表面の酸化した、いわゆる赤錆を除去し、さらに水素イオン ( $H^+$ ) が活発となり、管壁面に水素イオン皮膜を形成することになる。この水素イオン皮膜によって水中の溶存酸素や残留塩素等の腐食性ガスと管壁面との接触を防ぎ、酸化による赤錆の発生を防ぐことが可能となる。

【 0 0 3 5 】

また、水中には水酸イオン ( $OH^-$ ) が大量に発生し、これにより PH が高まり、ヒドロキシルイオン ( $H_2O_2^-$ ) というマイナスイオンが発生する。これによりエンジン冷却水は活性化し不純物のない弱アルカリイオン水に変性されることで、エンジン冷却水用添加剤では防錆剤や不凍液の劣化を防ぎ、安定した防錆効果を持続させる。

【 0 0 3 6 】

さらに、エンジン冷却水用原液およびエンジン冷却水では、不凍液の劣化を防ぐと共に、活性化水と遠赤外線放射粉末との相乗効果によって赤錆の除去および赤錆の発生を防ぎ、安定した防錆効果を持続させる。

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【 0 0 3 7 】

また、図 3 および図 4 において本発明による他の作用効果を説明する。

エンジンのシリンダーブロック 6 に設けられる循環冷却管 5 内壁面側は前述したように水素イオンにより陽極となる。

一方シリンダー燃焼室 7 内に吸入されるガソリンと空気の混合気体中の酸素はマイナスイオンであるため、シリンダー燃焼室 7 内は陰極となる。その結果、循環冷却管 5 側からシリンダー燃焼室 7 内へと電流が生じ、この電気エネルギーによってシリンダー燃焼室 7 内の混合ガスに高速分子運動を起こし、シリンダー燃焼室 7 内の隔々までの混合気のクラスターを瞬時に細分化する。この細分化されたシリンダー燃焼室 7 内の混合ガスは燃えやすくなり、燃焼効率が上がる事が予想される。

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【 0 0 3 8 】

そこで前述した本発明のエンジン冷却水用原液を上水で 2.5 倍に希釈して日産プリメーラ（ガソリン車）：排気量 1990 cc のエンジン冷却水として注入した場合と、エンジン冷却水用原液として市販のロングライフクーラントをそのまま用いた場合での月平均 1,200 km 走行後の燃費を測定した。その測定結果を表 1 に示す。

【 0 0 3 9 】

【表 1】

注入前平均	7.75 km/l
注入後平均	8.95 km/l
向 上 率	15.52 %

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【 0 0 4 0 】

表 1 の測定結果から、本発明のエンジン冷却水用原液を注入後、1ヶ月の平均では 8.94 % の伸びを示し、2ヶ月後では 18.17 %、また2ヶ月間の平均でも 15.52 % と大幅な伸びを示していることから推測すると、6ヶ月後には 25 % 以上の改善効果がでるものと推定できる。

【 0 0 4 1 】

また、表 1 において使用した普通乗用車で本発明のエンジン冷却水用原液を注入後におけるエンジンのアイドリング時および毎分 1,500 回転時の排ガス中の CO<sub>2</sub>（二酸化炭素）、CO（一酸化炭素）、HC（炭化水素）および NO<sub>x</sub>（窒素酸化物）の排気ガス浄化率を測定した結果を表 2 に示す。

【 0 0 4 2 】

【表 2】

項 目	アイドリング時	1,500 回転/分
CO <sub>2</sub> （二酸化炭素）	30.0 %	36.3 %
CO（一酸化炭素）	18.2 %	56.0 %
HC（炭化水素）	56.0 %	70.5 %
NO <sub>x</sub> （窒素酸化物）	14.1 %	57.5 %

40

【 0 0 4 3 】

表 2 の測定結果から、アイドリング時の各種排ガスの浄化率は、CO<sub>2</sub> = 30.0 %、CO = 18.2 %、HC = 56.0 %、NO<sub>x</sub> = 14.1 % であり、毎分 1,500 回転時（走行時）では、CO<sub>2</sub> = 36.3 %、CO = 56.0 %、HC = 70.5 %、NO<sub>x</sub> = 57.5 % と大幅な各種排ガスの浄化率の向上となっている。この結果により走行時における有害排気ガスの抑制効果を得られることが判明した。

また、燃料消費量の抑制効果で各種は排気ガスの排出量が減少しており、測定はしていな 50

いもののエキゾーストパイプのカーボン付着具合から見て、PM（粒子状物質）の排出量も燃費が改善された分（15%以上）と同等の抑制がされているものと考えられることから、今後ディーゼル車での実証にも同様の結果は得られると推測されるものである。

【0044】

なお、前記表1～表3における比較実験においては本発明のエンジン冷却水用原液を使用した、このエンジン冷却水用原液以外の本発明のエンジン冷却水用添加剤およびエンジン冷却水を使用した場合でもほぼ同様な測定結果を得ることができた。

【0045】

【発明の効果】

以上述べて来た如く本発明によれば、添加液、あるいは不凍性を付与するためのエンジン冷却水用原液またはエンジン冷却水を活性化させたうえで、遠赤外線を放射する岩石を平均粒径10 $\mu$ m以下に粉碎した粉末を混入させることによって、活性化水との相乗効果によって冷却管内壁面に水素イオン皮膜を形成し、赤錆の除去および長期間の防錆効果が得られる。

【0046】

遠赤外線放射粉末としてSiO<sub>2</sub>とAl<sub>2</sub>O<sub>3</sub>を主成分とした天然岩石を平均粒径10 $\mu$ m以下に粉碎した粉末を用いることによって、表面積の増加により遠赤外線の放射効率を高めることができ、これにより、冷却水に対する必要な混入量が少なくてすみ、冷却水への均質な混合ができ、かつ循環冷却装置内で沈殿することもなく、装置内の目詰まりや摩耗による影響が発生することもない。

【0047】

また、冷却管内壁面に水素イオンによりシリンダー燃焼室内へと電流が生じ、この電気エネルギーによってシリンダー燃焼室内の混合ガスに高速分子運動を起こし、シリンダー燃焼室内の隅々までの混合気のクラスターを瞬時に細分化する。この細分化されたシリンダー燃焼室内の混合ガスは燃えやすくなり、燃焼効率が高まることにより燃費の向上および有害排ガスが著しく減少する効果が得られる。

【図面の簡単な説明】

【図1】本発明における活性化水の生成方法の一例を示す説明図である。

【図2】本発明の防錆作用を示す説明図である。

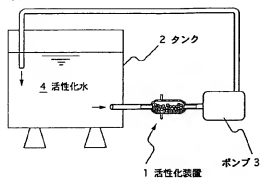
【図3】水冷式エンジンの概要を示す説明図である。

【図4】図3における部分拡大説明図である。

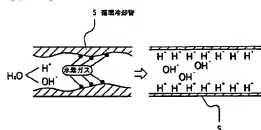
【符号の説明】

- 1 活性化装置
- 2 タンク
- 3 ポンプ
- 4 活性化水
- 5 循環冷却管
- 6 シリンダーブロック
- 7 シリンダー燃焼室

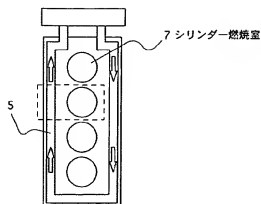
【 図 1 】



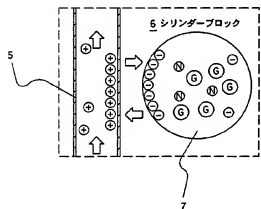
【 図 2 】



【 図 3 】



【 図 4 】



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